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Design of a Sales and Operations Planning (S&OP) process – case study

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Abstract

Nowadays, companies are facing a constant need to develop and increase coordination between operational functions to respond rapidly and accurately to customer requests. Linked with this need, an increasing number of practitioners are resorting to an established and integrated business management methodology, the Sales and Operations Planning (S&OP). The concept of S&OP has gained increased recognition over the years by several authors and companies. This project describes the S&OP implementation in Sogrape Vinhos (wines) S.A., a Portuguese wine producer and distributer. The company was confronted with low accuracy in the establishing the forecast demand plans, especially on a long-term horizon. In order to increase the demand plans accuracy, the company started a S&OP implementation program. This paper describes the company's current planning process, explains the S&OP's implementation model presenting the selected parameters adequate to the company's context, and finally, evaluate the expected outcomes of this project. Preliminary results from the S&OP implementation project at Sogrape indicate significant savings at the operational level and greater effectiveness in developing the company's demand plans.

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1. Introduction

Sogrape Vinhos, S.A., a Portuguese wine producer and distributer (whose most known wine is Mateus Rosé) is currently competing in a globalized and turbulent market. The company is facing critical problems to balance the supply capacity with an unpredictable and seasonal market demand. Within this new setting, Sogrape Vinhos is encountering a constant need to develop and increase the alignment and coordination between the different operational functions to respond rapidly and accurately to customer requests.

In order to better respond to the challenges that the company is facing, their management has started the study, and subsequently the implementation of a new operational management model based on the Sales and Operations Planning (S&OP). This business management approach presents itself as a promising tool [1]. This conceptual process approach has been put forward in the scope of the Supply Chain Management (SCM) and presents according to several practitioners, the most exciting possibilities for the future [2]. And according to Aberdeen Report, the S&OP was further identified as a major area of focus within SCM for extended companies [3]. S&OP is described as a cross-functional long-term planning process that links different business plans into one integrated set of plans with the main purpose of balancing supply and demand and linking the strategic plans to the operational plans of the firm [4]. The benefits of S&OP are many and it is claimed that a successful S&OP initiative can improve the accuracy of forecasts on the order of 20% to 50%, reduced inventories by 10 to 30%, a 5% to 15%

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reduction in manufacturing downtime and a 5% to 10% increase in on-time delivery [5]. Furthermore, an effectively implemented S&OP process can increase revenue from 2% to 8% and improve the success of new products launches by 20% [6]. In short, S&OP, with the necessary support of technology and analyzing methods, increases a firm's ability to adapt to unplanned events [7].

However, the design of the process in manufacturing planning and control must be linked to the context of the company, so it is necessary to design and structure the S&OP process in order to fit into her environment.

Sogrape's operational departments are aware of the low accuracy that the company's demand plan tends to have, especially on a long-term horizon. Not having a sufficient planning process that aims to balance demand and supply in an adequate way, has thereby a high influence on the company's activity performance. There are two situations that often arise in Sogrape, depending on the season:

- Demand exceeding supply, causing a risk of poorer delivery service to customers, including lower service level and longer delivery lead times [8];
- Capacity exceeding supply, causing a risk of increased stocks, which implies high levels of tied up capital as well as high storage costs [8].

Both of these situations are caused by the inexistence of an accurate demand plan, reviewed on a periodic basis, in which the Operations Departments can rely on when estimating the needs of raw materials and developing the production plan. This non-alignment between Sales/Marketing and Planning/Manufacturing results in high costs for the company that could be mitigated through the implementation of a S&OP support process.

The purpose of this paper is to explain the S&OP implementation model in Sogrape Vinhos, S.A. designed to support the improvement of a flexible and efficient SCM and finally, evaluate the expected outcomes of this project.

2. Literature review

2.1. Sales and Operations Planning definition

Sales and Operations Planning is defined by the American Production and Inventory Control (APICS) as:

A process to develop tactical plans that provide management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain. The process brings together all the plans for the business (sales, marketing, development, manufacturing, sourcing, and financial) into one integrated set of plans [9].

S&OP was introduced in the late 1970s by the business consultant Oliver Wight. The process started to evolve as organizations started to share S&OP experiences in organizations such as APICS and, in 1987, the S&OP process was defined as a business process with the goal of balancing supply and demand [7]. The traditional approach has however been extended in the literature over the years, and S&OP is nowadays often described by the practitioners as a support for companies maximizing opportunity, minimizing risk, and making conscious trade-offs based on profitability [10]. A few studies also demonstrate that companies that thoroughly implement the S&OP process have a superior operational performance against the ones that partially use it or that do not use it at all [11]. The S&OP process may be synthetized into five main features [4]:

i. It is a cross-functional and integrate tactical planning processes;
ii. It integrates the business plans in a single plan;
iii. It comprehends a planning horizon of over 18 months;
iv. It links strategy and operations;
v. S&OP creates value and is related with the performance of the firm.

2.2. Sales and Operations Planning structure

Sales and Operations Planning is performed in a stepwise process with different departments involved. The five steps that should be included in the S&OP process are described below.

1. Create unconstrained demand forecast

The first step of the S&OP process consists in gathering unconstrained projected sales data that is used as an initial forecast. The unconstrained forecast, that is typically performed by the sales and marketing departments, should center on what customers want to buy, irrespective of the production limitations. The expected outcome of this first step is an unconstrained demand plan, which is the basis of the S&OP process [2;12].

2. Create initial supply plan

In the second step of the process, operations/supply chain teams collect data about internal capacity, such as inventory capacity and strategies, manufacturing, logistics and supply chain capacities. Then, using the unconstrained, consensual demand forecast as an input, the best alternatives are analyzed according to the business plan regarding profitability, revenue and customer service. These inputs combined with the demand plan, are used in the creation of the initial supply plan [10].

3. Develop a final consensus operating plan

In the third step of the process, the S&OP team, which includes representatives from sales, marketing, operations, and finance, meet to develop the final demand and supply plan that sets the guidelines for the upcoming cycle. The final plan should balance the supply and demand plans, reaching the company's overall business and strategic goals. There should be included the demand and supply plans and discussed the different scenarios and inherent consequences, risks and opportunities [10]. Afterwards, the company's management should approve the agreed plan and settle actions that need to be taken [2].

4. Communicate and implement plan

The fourth step of the plan includes the publication and communication of the final agreed S&OP plan to all involved parties, such as operations, sales, marketing and finance, and its implementation. The marketing department should be aware of the quantities they agreed to sell, and the operations

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departments are compromised to make sure that the volumes established in the plan are produced and delivered on time [2].

5. Measure process performance

The performance of S&OP should be measured so it can be improved through learning over time [11]. As so, the fifth and final step of the S&OP process aims at measuring and control the effectiveness of the plans and the S&OP process itself, through Key Performance Indicators (KPI). These measures vary among industries but the main metrics that should be tracked over time include operational and commercial KPI, that must be shared between all the departments involved in the process [2].

2.3. Sales and Operations Planning maturity model

A maturity model can be defined as a staircase that describes how companies manage a certain area of their business. The purpose of these models is to diagnose what stage the company is currently in, recognize where gaps exist compared to the next stage and best-practices, and then point the way up to the next level [13].

The maturity model used in this paper (see Figure 1a and 1b) consists of four stages, with the first one being the least advanced process and the last step being the most advanced process and practically unachievable, becoming the benchmark to which companies strive so achieve and against which compare progress. The four stages are (i) marginal process, (ii) rudimentary process, (iii) classic process and (iv) ideal process, and each stage can be described regarding (a) meetings held, (b) plans alignment and (c) technologies used [13].

	Stage 1 Marginal Process	**Stage 2 Rudimentary Process**
Meetings	- Informal meetings; - Sporadic scheduling.	- Routine Schedule; - Spotty attendance and participation.
Plans alignment	- Disjoint demand plans; - Supply plans not aligned to demand plans.	- Demand plans reconciled; - Supply plans aligned to demand plans.
Technologies used	- Minimal technology-enablement; - Multitude of spreadsheets.	- Standalone multi-facility APS system; - Standalone demand planning system; - Systems interfaced in a one-way basis.

Fig. 1a. Four-stage S&OP process maturity model [14].

	Stage 3 Classic Process	**Stage 4 Ideal Process**
Meetings	- 100% attendance and participation.	- Event-driven meetings.
Plans alignment	- Demand and supply plans jointly aligned; - External collaboration with limited number of suppliers and customers.	- Demand and supply plans aligned internally and externally; - External collaboration with most suppliers and customers.
Technologies used	- Demand planning packages and supply planning applications integrated; - External information manually brought into the process.	- Advanced S&OP workbench; - External-facing collaborative software integrated to internal demand-supply planning. systems

Fig. 1b. Four-stage S&OP process maturity model [14].

An effective use of S&OP drives dramatic improvements in key business performance metrics, supporting the growth of the top line of the business while reducing operating costs and reducing inventory required [14]. Moreover, according to the 2015 survey "The S&OP Pulse Check", the implementation of the S&OP process results in better communication and collaboration between functions and more data driven and factual decision making [15].

3. Case study

3.1. Sograpе's current planning process maturity

Before developing and implementing S&OP process itself, it is imperative to understand the degree of maturity a company have on this theme. In order to get this knowledge, the maturity model presented in Chapter 3.3 was used to characterize the planning process in Sograpе regarding the meetings held, the alignment of the different plans and the technologies used. The methods used to gather the information needed to characterize the company's current planning process, were mainly observations and informal discussions.

Meetings

The only meeting in Sograpе in which the demand plans are reviewed is the monthly-based meeting between Sograpе Wines and Sograpе Distribution, which is the Sograpе Wines' Portuguese distributor, attended by Sograpе wines' Planning department and Sograpе Distribution's Sales department. At these meetings, sales deviations by product in the month prior to the meeting and Year-to-Date (YTD) are analyzed. If there are identified any significant sales deviations, the sales forecast of the following four months is revised in order to

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mitigate further deviations. Sales department also notifies Planning department of possible sales opportunities so that this department may subsequently evaluate the possibility of achieving the goals. Although these meetings are held with the aim of reviewing the Portuguese market's sales plans, there are no such meetings for the external markets, causing the emergence of urgent and unplanned sales opportunities, as they have not been previously disclosed.

Because no formal S&OP process was identified in Sogrape and there are no meetings to which the Sales, Marketing, Planning and Manufacturing departments attend, Sogrape is considered being at Stage 0 in the Meetings dimension.

Plans alignment

The data collected indicated that the Marketing/Sales departments usually coordinate sales plans with the Planning department, which coordinates them with the Manufacturing department. This *modus operandi* results in no interaction between the Manufacturing and the Marketing/Sales department, and thus leads to a complete lack of understanding of the Manufacturing area by the Marketing/Sales departments, and vice versa.

The demand plan that is used in Sogrape for the planning process, which is also the annual budget, is developed once a year, for the following year. In the month of September of each year, several departments begin to collaborate in the elaboration of the budget for the following year, in which is added by each market/area manager the forecasts of sales of each product for each client, thus forming a demand plan, usually based on previous year's sales history. This file is managed by the Planning department and the quantities indicated in it are manually entered into the ERP software (SAP). These quantities become visible to the Production sector in order to schedule the production plan, and to generate material purchase needs by Material Requirement Planning (MRP), with a three-month horizon. However, this forecast is rarely reviewed during the year by area managers, being only corrected on a monthly-basis by the Portuguese market Sales department. As consequence, it is common to appear unexpected business opportunities that become urgent as they have not been previously disclosed to the other departments

The only situations where the demand plan of the external markets is reviewed is when it is necessary to purchase some raw material in a small quantity in order to fulfill an order, and the Planning department questions Sales about the sales prospects, so that a larger quantity of that material can be bought and thus Sogrape can get a better price. Moreover, the Planning department also asks Sales to review the demand plan for production optimization purposes.

Although some level of planning is done in Sogrape, the general perception is that planning is done at a short-term and that efforts are focused on reacting quickly to changes instead of predicting them. Nevertheless, the described above annual sales budget could be used as the demand plan for the S&OP process and, if reviewed every month and presented to the other departments at S&OP meetings, it could be of great value in predicting the following months' demand and reacting to them.

By accomplishing the previous level of integration, Sogrape is then considered being at Stage 2 on the scale in the Plans alignment dimension.

Technologies used

In Sogrape, Manufacturing, Planning, Marketing and Sales areas have its own, and distinct, software technology and process. The Manufacturing and Planning sectors use SAP ERP to schedule productions on each production line and to determine the needs of raw materials, while Marketing and Sales areas develop the demand plans through spreadsheet-based files. Demand-side departments' spreadsheet files are shared with the Planning department, which delivers them to the system used by the supply-side, SAP, to develop supply plans that are established also in SAP, according to the demand plans received.

Since demand-side departments use their own applications and then transmit the outputs to the supply-side given the existence of multiple spreadsheets, Sogrape is considered being at Stage 1.5 on the scale in the Technologies used dimension.

3.2. Expected Sogrape's Sales and Operations Planning process maturity

The current section aims at assessing Sogrape's planning process maturity after S&OP's implementation, and after describing S&OP's goals and parameters at the company. Sogrape's planning process after S&OP's implementation was also characterized according to the maturity model described in section 2.3, concerning its three dimensions: meetings, plans alignment and technologies used.

Meetings

Through the implementation of S&OP's process in Sogrape, meetings would be routinely held (monthly) and attended by cross-departmental participants to align supply and demand plans. Given that during the meetings, both plans are not fixed, and open for discussion and adjustments, Sogrape's top management should attend the meetings in order to decide the necessary adjustments of the plans. Concerning external data, information from some customers about their future demand needs and from critical-component suppliers about scarce materials should also be brought into the S&OP process.

The presented characterization of the Meeting dimension should be considered at Stage 3.

Plans alignment

The software SAP – Sales and Operations Planning would allow the complete integration of demand and supply plans through a real-time unified model of demand, supply chain and demand.

Since the tool integrates and synchronizes both demand and supply plans, it would immediately reflect in the overall supply-demand scenario any change in either the demand or the supply plans. Hence it would also support the meetings, allowing users to instantaneously evaluate any modifications of any plan changes.

Given that currently the demand supply plans are aligned internally but not externally, the presented characterization of

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the Plans alignment dimension should be considered at Stage 3.

Technologies used

The information system SAP – Sales and Operations Planning can be used to perform instant and interactive simulations and scenario/what-if analysis, using the S&OP data model to support demand-supply balancing decisions.

Moreover, SAP's S&OP software also generates dashboards to display various metrics that compare the planned supply with the unconstrained demand plan. Furthermore, the dashboard functionality also displays KPI that measure and control the effectiveness of the plans and of the S&OP process itself.

Using this information system, internal integration would be totally fulfilled. However, in order to achieve a Stage 4 level regarding the Used Technologies dimension, external information systems should be integrated to the internal demand-supply system. This loosely collaboration with external parties in the Sograpе's initial S&OP process result in a Stage 3 level on the scale of the Technologies used dimension.

After the complete implemention of the S&OP process in Sograpе, the Meetings, Plans alignment and Technologies used dimensions would assume a higher level on the scale of the maturity model.

3.3. Expected outcomes of the Sales and Operations Planning in Sograpе

Regarding the following quantitative analysis of the S&OP expected outcomes, the values presented are masked due to their confidentiality. Nevertheless, as they are proportional to the actual figures, the obtained results are valid for the assessment of the real situation of the company.

Since some of the main objectives of S&OP implementation in Sograpе are related with the reduction of costs in the Manufacturing sector and the reduction of inventory levels, they were analyzed as potential savings resulting from the S&OP process. For each analysis two scenarios were designed:

- Scenario 1 – a more optimistic scenario, resulting from a high level of confidence in demand forecasts accuracy;
- Scenario 2 – a more conservative scenario, which is based on a larger forecast error; in this scenario, the definition of the targets and of the levels of attainment was more conservative.

3.3.1.Reduction of costs in the Manufacturing Process

The development of a reliable long-term demand plan, promoted by the S&OP process, which, according to the research, enhances the accuracy of forecasts in the order of 20% to 50% [5], allows the maximization of direct productions in which the product is automatically bottled, labelled and packed into finished-good, ready to go out to the market.

To analyze the outcomes of the maximization of direct productions in Sograpе, the following topics were taken into account:

- Two production centers (table wine and Port wine) and garrafeira products that could be directly produced;
- Constant annual bottling volume (it was considered the bottling volume from 2016), in the 5 years of analysis;
- Savings' estimation results from the difference in costs between direct productions and indirect productions (bottling for garrafeira + later assembling).

Through SAP 2016's bottling volume was consulted and identified which products' productions followed the direct and indirect approach. From this analysis, it was verified that about 87% of the total volume could be directly produced. However, in 2016, the percentage of direct production had been only around 44%. Then, two scenarios have been created for the analysis of savings:

- Scenario 1: considers that is possible to directly produce 80% of the annual bottling volume. This target is achieved after five years with the annual evolution presented in Table 1;
- Scenario 2: considers that is possible to directly produce 70% of the annual bottling volume. This target is achieved after five years with the annual evolution presented in Table 1.

Table 1. Annual evolution of the direct production percentage

	Year 1	Year 2	Year 3	Year 4	Year 5
Direct production (scenario 1)	50%	60%	70%	75%	80%
Direct production (scenario 2)	45%	55%	60%	65%	70%

Considering that the savings between the indirect production and direct productions is 0.0105 €/bottle, the savings for the two scenarios are presented in Table 2.

Table 2. Reduction of costs in the Manufacturing process

Scenario 1	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Direct production	44%	50%	60%	70%	75%	80%
Savings [€]	-	7,241	18,726	20,210	35,952	41,695
Scenario 2	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Direct production	44%	45%	55%	60%	65%	70%
Savings [€]	-	1,499	12,984	18,726	24,468	30,210

3.3.2. Reduction of costs in the total stock

According to the academia, companies that have effectively implemented the S&OP process have faced reductions in inventory levels on the order of 10% to 30%. Considering that, the two scenarios presented below were considered:

- Scenario 1: considers that is possible to reduce inventory levels of around 20%. This target is achieved after five years with the annual evolution presented in Table 3;

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• Scenario 2: considers that is possible to reduce inventory levels of around 10%. This target is achieved after five years with the annual evolution presented in Table 3.

Table 3. Annual total stock Reduction.

	Year 1	Year 2	Year 3	Year 4	Year 5
Annual stock reduction	10%	25%	55%	70%	100%

By adding up the possible savings to be achieved by reducing stock both levels, of final product and of raw materials, it is possible to estimate the total savings as presented in Table 4.

Table 4. Total stock cost reduction results.

Scenario 1	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total stock [k€]	4,998	4,898	4,748	4,448	4,289	3,998
Savings [k€]	-	100	250	550	700	1000
Scenario 2	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total stock [k€]	4,998	4,948	4,873	4,723	4,648	4,498
Savings [k€]	-	50	125	275	350	500

4. Conclusions

The results' studies carried out under this paper's scope prove that the implementation of this process in Sogrape can provide very significant savings. Considering a more optimistic scenario, it would be possible to achieve savings in the last year of study of about 1,041,269€ and, even considering a more conservative scenario, the savings would continue to be substantial, about 529,997€.

In addition to the measurable savings, there are qualitative benefits resulting from the implementation of this project which are more difficult to quantify. Among the expected benefits, the project implementation team can point out an increased visibility and quality of information available to support the decision making of the different stakeholders; the creation of mechanisms to support a faster and better decision making; improved communication and flow of information among the different departments which foster alignment and faster problem solving and increasing teamwork effort.

Concerning future research, the next step would be to schedule the full implementation of the process in the company. After the completion of the process implementation, it would be necessary an independent assessment of the major company process KPI's. With this information, the subsequent next step improvements using S&OP maturity models, should be defined and assessed. Moreover, future research could use those next improvement steps as a starting point to guide similar improvement projects in other wine companies replicate Sograpе's model. This would create a general S&OP transferable model that could be used for case studies in other companies.

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